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(54) Communications system, network, portable device and method

(57) A communications system (5) has a network (10) arranged for communication with portable communications devices (100, 200), according to a communications scheme. The communication system farther comprises a user profile register (130, 230) for storing a power profile of operating modes of a device (100, 200). The network (10) is arranged to modify the communication scheme in dependence upon the power profiles so as to dynamically control the power consumption of the devices (100, 200).

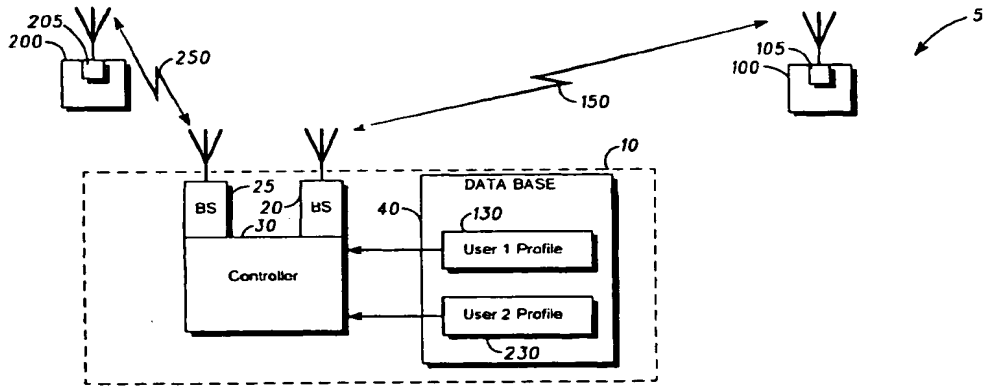

FIG.1

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Description

Field of the Invention

[0001] This invention relates to a communication system, and particularly but not exclusively to a cellular communications system.

Background of the Invention

[0002] In a cellular communications system, a number of portable devices within a cell typically communicates with a base station of the cell via a number of channels.

[0003] There is a desire to reduce the power consumption of portable devices, so as to increase the available 'on' time of the devices when operating with a battery.

[0004] A known problem with this arrangement is that typical base stations require portable devices within them to operate according to certain criteria which results in high power consumption. For example, a base station may require that all portable devices connected to it exhibit certain power characteristics, or transmit a location signal at regular intervals.

[0005] To mitigate this, it is known to control, from a base station of the system, the power output transmitted by a portable device, in response to received signal strength of the power output at the station. In this way the base station has an effect on the power consumption of the portable device.

[0006] However, this does not have an effect on improving the power consumption of the portable device when it is not transmitting.

[0007] This invention seeks to provide a communications system, network, portable device and method which mitigate the above mentioned disadvantages.

Summary of the Invention

[0008] According to a first aspect of the present invention there is provided a communications system as claimed in claim 1.

[0009] According to a second aspect of the present invention there is provided a portable device as claimed in claim 2.

[0010] According to a third aspect of the present invention there is provided a communications network as claimed in claim 3.

[0011] According to a fourth aspect of the present invention there is provided a method as claimed in claim 4.

[0012] In this way a communications system is provided in which the network is able to influence the power consumption of the portable device during various modes of operation.

[0013] An advantage of the invention is that it allows a network operator to differentiate its products from the products of other network operators by proposing a complete solution to the end user, including a solution in which the portable device is fully controlled by the operator.

Brief Description of the Drawings

[0014] A exemplary embodiment of the invention will now be described with reference to the drawings in which:

FIG. 1 shows an exemplary embodiment of a communications system in accordance with the invention, and

FIG. 2 shows a power profile of a portable communications device forming part of the system of FIG. 1.

Detailed Description of a Preferred Embodiment

[0015] Referring to FIG. 1, there is shown a communications system 5, such as a Coded Digital Multiplexed Access (CDMA) cellular system. The communications system 5 including a network 10 and first and second portable devices 100 and 200 respectively.

[0016] The network 10 has a number of base stations, including the first base station 20 and the second base station 25, which provide an air interface with the first and second portable devices 100 and 200 respectively, over a plurality of radio frequency channels. The present invention may also be used in an arrangement where two mobiles operate in the same cell. In this case of single cell operation, the base station 20 and the base station 25 are the same.

[0017] The first portable device 100 has a power amplifier 105 and the second portable device 200 has a power amplifier 205. The power amplifiers 105 and 205 are arranged for transmitting on any selected one of the plurality of radio channels of the air interface.

[0018] The network 10 also has various infrastructure components, such as a controller 30, and a database 40. The controller 30 is arranged to manage the network 10 through controlling the activities of the first and second base stations 20 and 25 respectively.

[0019] In a preferred embodiment, the database 40 contains first and second user profile registers 130 and 230. These registers contain information about the users of the first and second portable devices 100 and 200 respectively such as the type of service, the quality of service, the target power consumption, mobility, talk-time versus standby time, required and/or paid for by the user, and also information about the nature of the portable devices, to be further described below.

[0020] The user profile registers 130, 230, may also or alternatively be located in the respective portable devices. For example, the first user profile register 130 may be located in the sports portable device 100 and the second user profile register 230 may be located in

the second portable device 200. In the case where a portable device comprises a terminal and a Subscriber Identity Module (SIM) card, the user profile registers my be located in the terminal or in the SIM card or again in both. The information held in the user profile registers may then contain the technology parameters of the even terminal as well as the user profile of the given subscriber.

[0021] If possible, the information held in the user profile registers 130, 230 is preferably derived by statistical information gathered by the communication system and continuously updated.

[0022] Referring now also to Fig. 2, there is shown an example of a power profile 50 of the portable device 100.

[0023] The power profile 50 relates to different modes of operating which are required by the network 10 for communication, and the power consumption of the portable device 100 for each mode. A low power (idle) mode of operation 60 occurs when the portable device 100 is not communicating over the air interface. The amount of power consumed in the low power mode 60 is dependent upon the technology within the portable device 100.

[0024] A receive (Rx) idle mode of operation 70 occurs when the portable device 100 is set to receive signalling transmissions from the network 10, over the air interface, such as paging messages. The amount of power consumed in the Rx idle mode 70 is dependent both upon the technology within the portable device 100, and also system parameters that may be sent by the network such a the type of modulation scheme chosen by the network 10 for the signalling transmissions (since different schemes have different data transfer rates). The number of signalling transmissions received in a given time will also influence the power consumption of the portable device 100, since this will determine the number of times the receive idle mode 70 will occur.

[0025] A transmit (Tx) idle mode of operation 80 occurs when the portable device 100 is set to transmit signalling transmissions to the network 10, over the air interface. The amount of power consumed in the Tx idle mode 80 is again partly dependent upon the technology within the portable device 100, but also upon the power output and efficiency determined for the power amplifier 105, and the type of modulation scheme. The number of signalling transmissions required from the portable device 100 will also influence the power consumption, since this will determine the number of times the transmit idle mode 80 will occur. One type of signalling transmission required from the portable device 100 is a location update transmission which enables the network 100 to know which base station will be used for traffic transmissions with the portable device 100.

[0026] A receive (Rx) active mode of operation 75 occurs when the portable device 100 is set to receive traffic transmissions from the network 10, over the air interface, such as voice transmissions. The amount of power consumed in the Rx active mode 75 is dependent both upon the technology within the portable device 100, and also system parameters that may be sent by the network such as the type of vocoder scheme chosen by the network 10 for the traffic transmissions (since different schemes have different data transfer rates), and by the traffic rate.

[0027] A transmit (Tx) active mode of operation 85 occurs when the portable device 100 is set to transmit traffic transmissions to the network 10, over the air interface. The amount of power consumed in the Tx active mode 85 is again partly dependent upon the technology within the portable device 100, but also upon the power output and efficiency determined for the power amplifier 105, the type of vocoder modulation scheme, and the traffic rate.

[0028] FIG. 2 represents a model with five modes of operation, but the invention applies whatever the number of modes of operation for the power profile. For example, a model with nine modes of operation may also be envisaged, including low power idle mode, receive idle mode, transmit idle mode, receive speech mode, transmit speech mode, receive low data rate mode, transmit low data rate mode, receive high data rate mode and transmit high data rate mode. A model with only one mode of operation may also been envisaged. The number of modes of operation may vary from one portable device to another in the communication system.

[0029] The power profile 50 reflected by appropriate data values stored in the first user profile register 130 of the database 40. The data values indicate the amount of power consumed and the duration of power consumption for each of the above modes, and how the amounts and durations will differ if the network 10 should modify one or more of the schemes or rates of transmissions identified above.

[0030] For example, the data values may reflect that for the Rx idle mode 70, a certain amount of power is consumed by the portable device 100 for a given modulation scheme and a given signalling rate (the rate at which the network 10 requires the portable device 100 to listen to the signalling transmissions), and how a change of the modulation scheme and/or signalling rate will affect the power consumption of the portable device 100.

[0031] The second user profile register 230 contains a similar power profile of the second portable device 200.

[0032] In operation, communication may be established between the first portable device 100 and the base station 20 using a first channel 150, and between the second portable device 200 and the base station 25 using a second channel 250.

[0033] In the present invention, the first and second user profile registers 130 and 230 are used by the controller 30,to dynamically modify a default communication scheme in different ways for each of the first and second channels 150 and 250, thereby influencing the

power consumption of the first and second mobiles 100 and 200.

[0034] The controller 30 may contain a microprocessor (not shown) arranged to perform an algorithm which determines modifications for each of the first and second channels 150 and 250. The algorithm may be arranged to optimise the power efficiency of every portable device within a even cell of the network 100, or to optimise the efficiency of certain users, for example those who pay a higher premium subscription.

[0035] In one example, a user who has paid a premium subscription may not be required to perform a location update signalling transmission at all. The result will be that an announcement of an incoming call, instead of being routed to one base station, will be broadcast over the whole network 10. This would be impossible to do for every user of the network 10, but premium subscribers could have this facility, thereby reducing the power consumption of their portable devices.

[0036] Alternatively, the algorithm may be arranged to arbitrate for power efficiency between portable devices.

[0037] In another example, an algorithm may be arranged to identify the mode of operation which has the most significant impact on the total power consumption and to then optimise the communication scheme or system parameters for this particular mode, and relax the communication scheme or system parameters for the other modes. As an example, if the portable device is an old device, and if the talktime is negligible compared to the standby time, then the low power idle mode may be the main contributor to the total power consumption. In this case, the algorithm may operate to relax all the system parameters for this specific device. Also, in this specific case, the baseband processing with high quality of service may be chosen. This will have low impact on the total power consumption.

[0038] Even if the above algorithm is used, the user profile may still indicate user preferences which would modify the algorithm. For example, the user may request to optimise only the idle mode. In this case, the algorithm will optimise the idle modes and relax the traffic modes.

[0039] The invention may also be used in GSM systems to decide whether one of the HR, FR, EHR, or EFR communication schemes may be chosen, according to the impact of the traffic modes of operation on the total power consumption.

[0040] The information held the user profile registers may include information on the remaining battery life of a portable device. This may be either monitored in the network, or sent as information by the portable device. When the battery life is low, the network may optimise drastically the power consumption in the device.

[0041] The communication schemes or system parameters of different devices may be modified differently for each device. The modifications to a communication scheme of a device can be transmitted on a dedicated signalling channel or a broadcast signalling channel. In the latter case, several types of portable devices are defined. The values of the system parameters for each type of portable device are broadcasted and a device retrieves the appropriate values corresponding to its own type.

[0042] As mentioned above, the user profile registers may be located in the network and/or in the portable devices. Whatever the location of the registers, a communication protocal between the registers and the network allows the algorithm in the network to use the values stored in the user profile registers.

[0043] It will be appreciated that alternative embodiments to the one described above are possible. For example, the database 40 may be incorporated in the controller 30, or in another part of the network 10.

Claims

1. A communications system (5) comprising :

   a network (10) arranged for communication with portable communications devices (100, 200);
   at least one portable communications device (100, 200) arranged for communicating with the network according to a communication scheme; and
   a user profile register (130, 230) for storing a power profile of operating modes of the at least one device, and wherein the network (10) is arranged to modify the communication scheme in dependence upon the power profile so as to dynamically control the power consumption of the at least one portable communications device (100, 200).

2. A portable communications device (100, 200) arranged for communicating with a network (10) according to a communication scheme, wherein the communication scheme is modified in dependence upon the power profile so as to dynamically control the power consumption of the at least one portable communications device (100, 200).

3. A communications network (10) arranged for communicating with at least one portable communications device (100, 200) according to a communication scherem,

   wherein the communication scheme is modified in dependence upon the power profile so as to dynamically control the power consumption of the at least one portable communications device (100, 200).

4. A method for controlling power in a portable communications device (100, 200), arranged for communicating with a communications network (10)

according to a communications scheme, the method comprising the steps of :

obtaining a power profile of operating modes of the device; and
modifying the communications scheme in dependence upon the power profile so as to dynamically control the power consumption of the portable communications device.

5. The system, portable communications device, network or method of any preceding claim, wherein there is provided a user profile register (130, 230) which is apart of the network (10).

6. The system, portable communications device, network or method of any preceding claim, wherein there is provided a user profile register (130, 230) which is a part of the at least one portable communications device (100, 200).

7. The system, portable communications device, network or method of any preceding claim, wherein the portable communications device (100, 200) comprises a terminal and a SIM card and there is provided a user profile register (130, 230) which is located in the terminal or the SIM card.

8. The system, portable communications device, network or method of any preceding claim, wherein the operating modes of the at least one portable communications device (100, 200) include signal transmission and reception modes.

9. The system, portable communications device, network or method of any preceding claim, wherein the communications scheme is modified in accordance with an algorithm arranged to arbitrate for power efficiency between portable devices.

10. The system, portable communications device, network or method of any preceding claim, wherein the communications scheme is modified in accordance with an algorithm arranged to optimise the operating modes which have the highest power consumption.

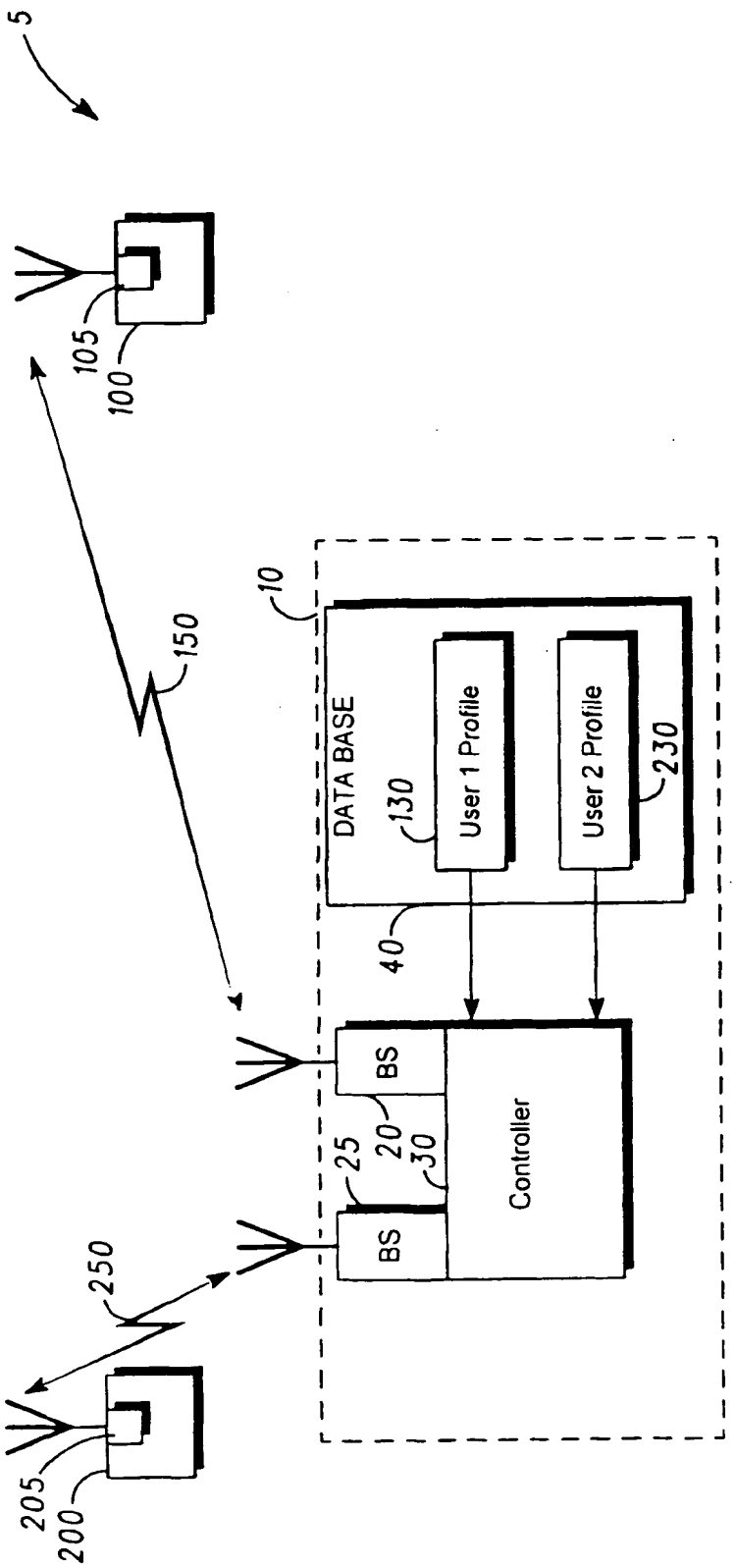
5
105
100
150
10
DATA BASE
130
User 1 Profile
User 2 Profile
230
40
BS
20
25
30
BS
Controller
250
205
200

FIG.1

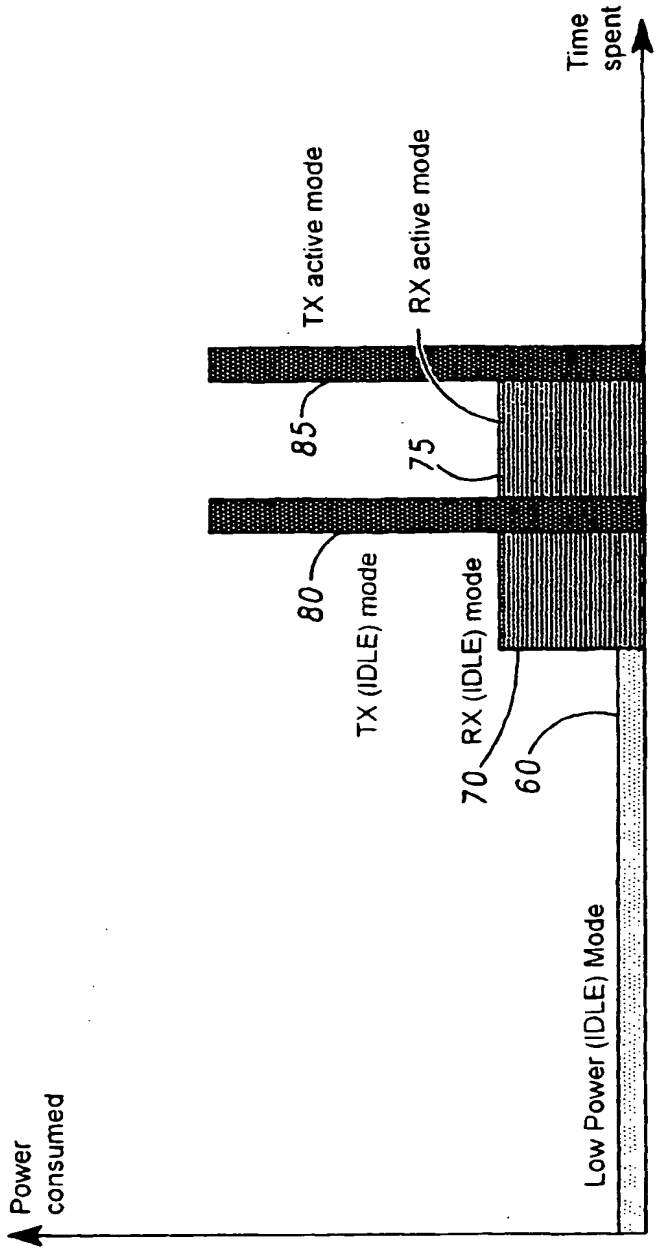
Power consumed
Time spent
TX active mode
RX active mode
TX (IDLE) mode
RX (IDLE) mode
Low Power (IDLE) Mode
85
75
80
70
60
50

FIG. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 97 40 2301

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X Y	US 5 666 649 A (DENT PAUL W) * abstract * * column 1, line 53 - column 2, line 21 * * column 3, line 21 - line 34 * * column 4, line 4 - column 5, line 11 * * claim 1; figures 1-3 *	1-6 7	H04Q7/00 H04B7/005 H04Q7/32
Y A	US 5 444 764 A (GALECKI DAWN M) * abstract * * column 1, line 51 - column 2, line 50 * * claims 1,2; figure 1 *	7 1-4	
A	WO 96 37053 A (ERICSSON GE MOBILE INC) * abstract * * page 4, line 8 - page 5, line 22 * * page 11, line 1 - line 26 * * claim 1; figure 2 *	1-4	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

H04B
H04Q

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	23 March 1998	Lopez Marquez, T

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